ekgMove

Mobile ECG and Physical Activity Sensor

User Manual

movisens

Imprint

User manual ekgMove

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1 Welcome!

Dear customer,

Thank you for choosing the ECG and Activity Sensor **ekgMove** from movisens. With this sensor, you get the newest technology for mobile monitoring of psycho physiological parameters in everyday life.

Please read this manual completely and thoroughly before bringing the measurement system into service! In his manual you will find all Information relevant to the use and maintenance of the measurement system as well as for solving problems.

If you have any further questions, don't hesitate to call us. It is our pleasure to help you:

Phone: +49 721 381344-0

2 Scope of application

ekgMove is a scientific research instrument, to capture the ECG and the physical activity of a person and other secondary parameters derivable from these measurement signals. ekgMove is designed and tailored for the use in research applications.

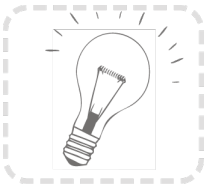
The ECG and activity sensor ekgMove is not a medical device!

The sensor acquires a single channel ECG signal. It can be used with a chest belt with dry electrodes or with one way electrodes. In addition to this, the sensor is measuring acceleration in three dimensions, air pressure and ambient temperature.

The configuration of the sensor is done from PC by means of the software included in this package.

ekgMove allows the measurement and in conjunction with movisens DataAnalyzer the analysis of the following parameters:

- Electrocardiogram
- Acceleration in three dimensions
- Air pressure and temperature
- Heart rate and heart rate variability
- Movement Acceleration and Step Count
- Activity Classes and Body Position
- Energy Expenditure



Tip:

On demand, other parameters could be calculated from raw data by movisens.

3 Instructions for use

- ekgMove is not a medical device.
- Only use ekgMove for the designated applications.
- Never open ekgMove.
- The battery of the ekgMove may only be changed by manufacturer
- ekgMove is not waterproof. Don't use the sensor in wet environments.
- Only use the ekgMove under the specified conditions.
- To charge the battery of the sensor, only use USB standard compatible devices.
- Only use movisens chest belts.
- If ekgMove is used with a chest belt, these have to be cleaned regularly.
- If there are any problems by using the sensor/chest belt (e.g. pressure marks, skin irritations, itching, redness of skin, hypersensitivity or other discomfort), please stop using the sensor/chest belt immediately.

4 Scope of delivery and accessories

In this chapter, you come to know which parts are within the scope of delivery and what is available as accessories.

All of these parts could be reordered. Please consider the order number in the following paragraph.

To use the sensor a computer is needed in addition to the scope of delivery.

4.1 Scope of delivery

The following components are included in delivery

Article	Order No.
ECG- and Activity Sensor ekgMove, Cradle with Micro USB Interface, Mirco USB Cable, SensorManager Software	10101

4.2 Accessories

The following accessories are available:

Article	Order No.
Chest Belt Size S	10105
Chest Belt Size M	10103
Chest Belt Size L	10104
Chest Belt Size XL	10106
Path adapter for one way electrodes	TBD
Micro USB Cable	30102
Cradle with Micro USB Interface	30105
Bluetooth-Dongle	30103
Micro USB Charger for 110-240V	30100
USB Hub, 7 Ports	30101

5 Description of the sensor

ekgMove can either be used

- with a comfortable chest belt with dry electrodes
- with two one-way electrodes

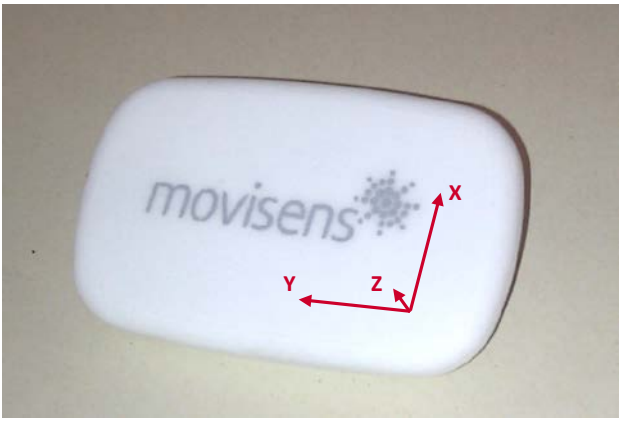
For long term measurements the belt is more comfortable. For short term measurements the one-way electrodes may be more practical.

The sensor can be attached to the belt by two press buttons.

If used with one-way electrodes, the electrode patch adapter has to be used.

Included in the delivery you also receive a cradle with a micro USB interface. To connect the sensor to a PC, you have to separate it from the chest belt or the electrode patch adapter and plug it into the cradle.

The axes of the integrated acceleration sensor are defined as described in the following figure:



The ekgMove sensor is equipped with a multi-colored LED to show the status of the sensor:

Status-LED	Meaning
Flashing red (once per second)	The sensor is active and records data
Flashing red slowly (every two seconds)	Delayed recording active
Flashing green	The sensor is connected to a PC or a charger. The battery is fully charged.

Flashing blue	The sensor is connected to a PC or a charger. The battery is actually being charged.
Flashing blue fast (three times per second)	The battery is flat, sensor will turn off soon.
Flashing Red fast (three times per second)	An error occurred. Please contact the manufacturer.
No LED active	The sensor is inactive.

Combination of red blinking and green blinking as well as red blinking and blue blinking are possible whit the appropriate combination of the above described meanings.

The ekgMove sensor features a vibration alarm to signal the beginning and the end of a measurement.

6 Software Installation

This chapter describes how to install and uninstall the software and how to update it. Beside this, the system requirements are defined.

6.1 System Requirements

Before installing the software, please check if the following system requirements are fulfilled.

- PC with Windows XP or higher
- Administrator rights during installation
- A minimum of 300 MB free space on hard disc

The delivered software consists of two programs:

- SensorManager: Program to configure the sensor, to start a measurement and to download the data from the sensor.
- UnisensViewer: Program to view the stored data.

6.2 Installing the software

Please ensure that your PC fulfills the requirements described above.

Step 1: Plug the USB drive into the USB port of your PC. The content of the medium will be shown.

> ! If the window does not open automatically, select the appropriate drive from the window “My computer”

Step 2: Double click the file "movisens_SensorManager_Setup_Full.exe"

✓ The Installation runs automatically in the background. After successfull installation, shortcuts are created in the Windows Start Menu under the entry "movisens SensorManager"

Step 3: Double click the file "UnisensViewer_Setup_Full.exe"

✓ The Installation runs automatically in the background. After successfull installation, a shortcut "UnisensViewer" is created in the Windows Start Menu.

6.3 Updating the software

You need an internet connection to make an update. Select Windows Start Menu → movisens SensorManager → Updater and respectively Windows Start Menu → UnisensViewer → Updater. If a new version is available, it will be downloaded and installed automatically.

6.4 Uninstalling the Software

The software can be uninstalled using the Windows Control Panel.

7 Handling

This chapter describes how to prepare a measurement and how to attach the sensor to a test person. Furthermore you get information to save, delete and analyze data from the sensor.

7.1 Charging the Sensor

Step 1: Connect the cradle with the USB cable to a USB port (USB port of your computer or another port that conforms to USB standard like USB hub or USB charger). Attach the sensor with the help of the push buttons at the cradle. Please make sure that the 4 contacts are connected (marked red in the picture).

✓ After connecting the sensor to a USB port, the charging process starts immediately. During charging, the status LED is blinking blue. If the sensor is fully charged, the LED is blinking green.

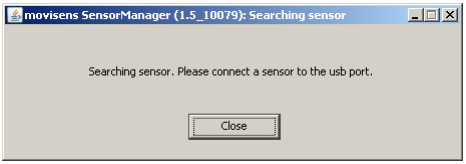
If the sensor is deeply discharged (e.g. after a long period where it was not used), it can take up to several minutes until the sensor reacts and can be identified by the computer.

7.2 Preparing a measurement

Before conducting a measurement please make sure you installed the software as described in chapter 6.1.

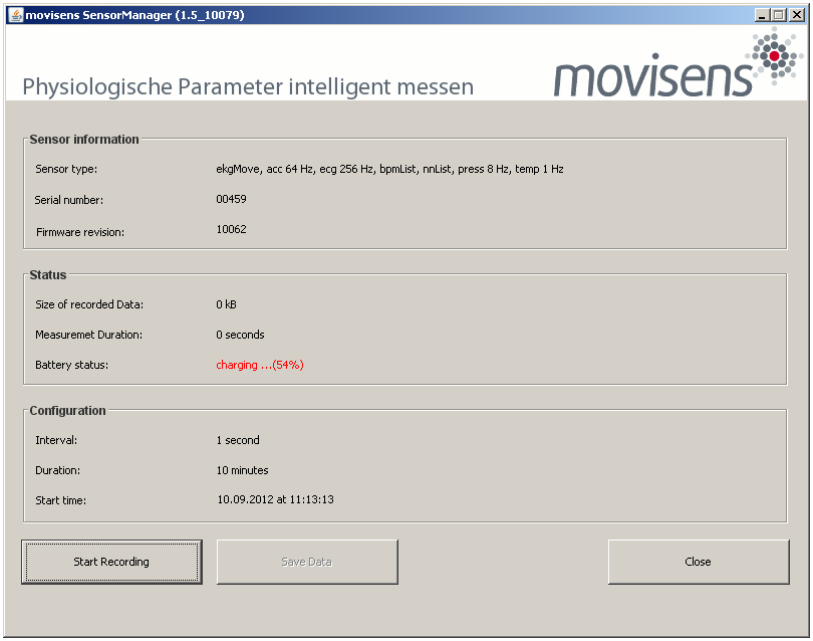
Step 1: Start the movisens SensorManager by selecting Windows Startmenu → movisens SensorManager → SensorManager

✓ SensorManager is now searching for available sensors.



Step 2: Connect the ekgMove sensor with your PC using the cradle.

✓ The software will automatically detect the device and open the following window:



This application shows information about sensor hardware, sensor state and sensor configuration.

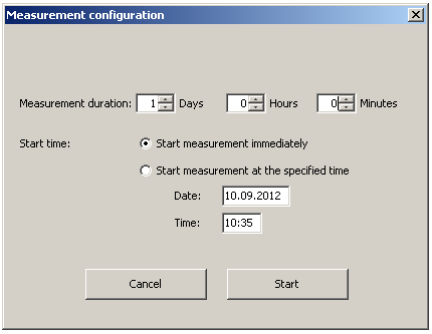
Before you start a measurement please check the charging status of the battery. The maximum measurement duration can only be reached when the battery is fully charged.

7.3 Starting a measurement

To start a measurement do the following steps:

Step 1: In the sensor manager software click on the „Start Recording“ button in the lower left of the window.

✓ You can see the following window:

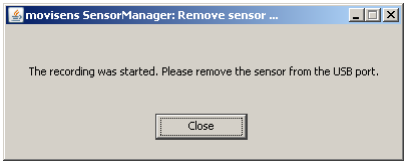


Step 2: Please supply the following information into the text fields:

- Measurement duration. The maximum measurement duration depends on the manufacturer configuration of your sensor.
- Start time. You can start the measurement immediately or delayed at a specific time. If you want to start your measurement delayed please specify date and time. The given time should not be more than 2 days from now.

Step 3: Start the measurement by clicking the „Start“ button.

✓ You can see the following window:

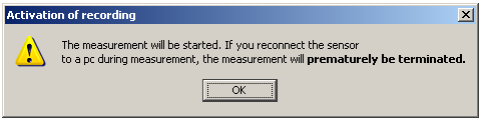


Step 4: Please follow the instructions and remove the sensor from the cradle.

✓ The status LED will flash red once per second as soon as the measurement has started and data will be recorded. If a delayed start was configured the LED flashes red every two seconds until the measurement starts.

✓ At the end of the measurement the LED stops flashing.

❗ If you reconnect the sensor after starting a measurement again with a PC, the measurement will be stopped prematurely.


Activation of recording
The measurement will be started. If you reconnect the sensor
to a pc during measurement, the measurement will prematurely be terminated.
OK

❗ If you connect the sensor to an USB charger, the measurement won't be stopped. That means you can extend the measurement duration by intermediately charging the sensor during a measurement.

Step 5 using a chest best: Attach the chest belt directly on the skin at the level of the sternum at the test person, so that the two snap fasteners point forward. Adjust the size of the chest belt so that it cannot slip out of position, but only so tightly that it can be worn comfortable over longer periods. Attach the ekgMove sensor at the two snap fasteners. The movisens label on the sensor has to be upright and readable.

Step 5 using one way electrodes: Attach the sensor to the electrode patch adapter. Attach two one-way electrodes to each side of the electrode patch adapter. Attach the sensor to the test person. The movisens label on the sensor has to be upright and readable

- Due to the long-term electrodes used in the chest belt, the maximum signal quality will be reached about 15 minutes after applying the chest belt to the skin. Therefore please take care that the chest belt is always attached long enough before the acquisition of relevant data. Otherwise strong artifacts can occur in the ECG signal, especially under vigorous movements (e.g. while running).

- To improve the signal quality you can moisten the electrode areas with water before you attach the chest belt.

Correct wearing position of chest belt and sensor

7.4 Stopping a measurement

The measurement will automatically be stopped, if the configured measurement duration has passed.

A running measurement will also be stopped when:

- The sensor is connect to a PC
- The end of the battery run time has been reached

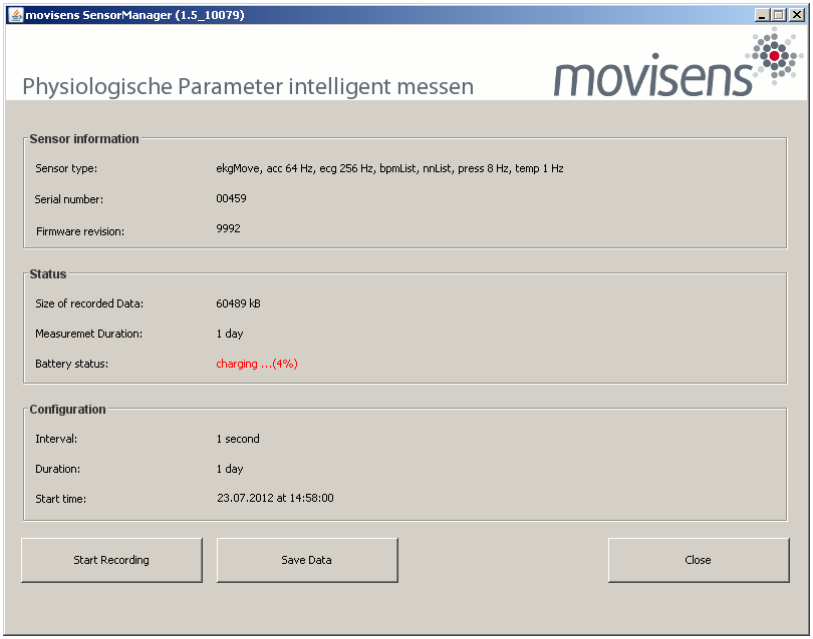
7.5 Storing measurement data

To store recorded measurement data on the PC do the following steps:

Step 1: Start the SensorManager by selecting Windows Start menu → movisens SensorManager → SensorManager

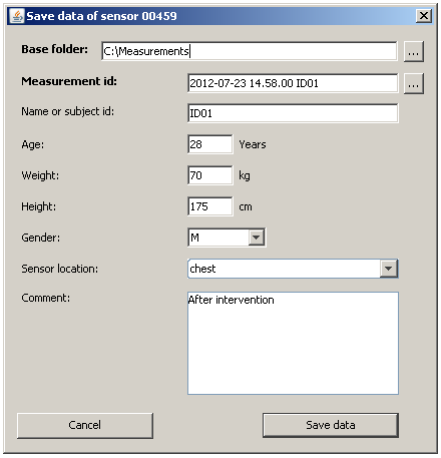
Step 2: Remove the ekgMove sensor from the chest belt or the electrode patch adapter and connect the sensor to the PC using the cradle.

✓ After the SensorManager has detected the connected sensor, the following windows will be shown:



Step 3: Click on „Save Data“.

✓ You will see the following window:



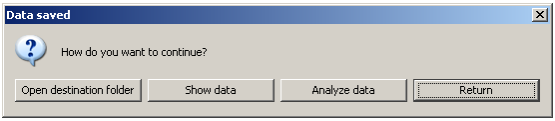
Step 4: Please type in the following information:

- Select the base folder, where your measurements should be stored. To do this, click the button after the text field.
- Type in the ID of the measurement. If you want to use date and time in the ID click the button after the text input field.
- All other information is optional. If the measurement data shall be further processed with the movisens DataAnalyzer the additional information is mandatory.

Step 5: Finally click on „Save data“

The measurement data will be stored in the Unisens format. Unisens is an open data format for multi sensor data. You can find further information about Unisens here: www.unisens.org

✓ The software confirms the end of data storing process. The following window is shown:

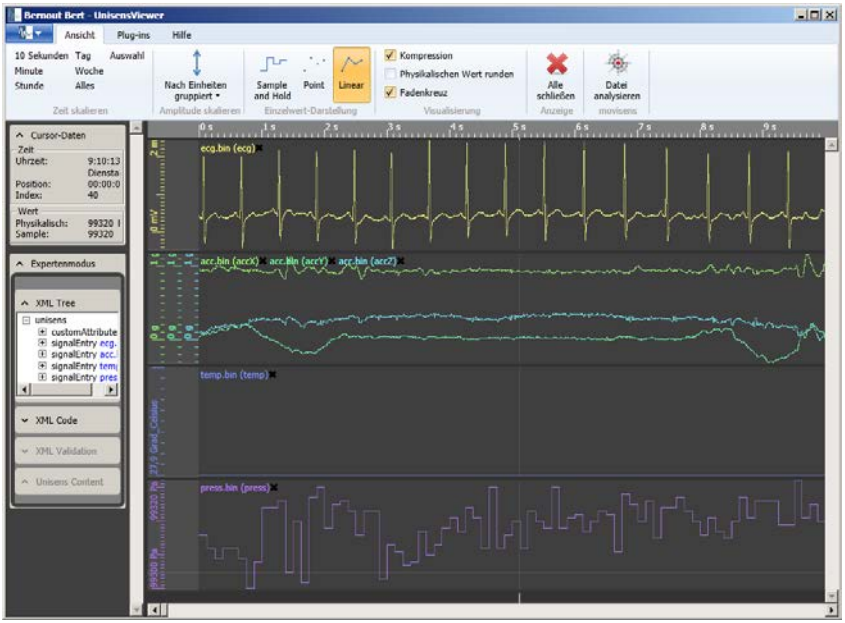


You can now directly show the stored data. The measurement will be opened in the UnisensViewer. If you have installed the movisens DataAnalyzer you can directly start data analysis and generate reports be clicking on “Analyze data”. You can find more information in the DataAnalyzer manual.

7.6 Viewing measurement data

To view recorded measurements click on „Show data“ directly after the string process.

To view previously stored measurements use the Windows Explorer to navigate to your measurements folder and then open the folder with the desired ID. Then double click on the “unisens.xml”-file. The measurement will then be shown in the UnisensViewer:



movisens also offers analyzing your data and generating reports according to your needs as a service. If you have any further questions, please do not hesitate to contact us.

8 Maintenance and proper disposal

8.1 Maintenance

Besides charging the batteries, the ecgMove sensor does not need any further maintenance. The battery capacity will decrease slowly with charging cycles and age. The battery can only be changed by movisens. Please contact us in the case when a replacement is necessary.

8.2 Cleaning instructions

If you want to clean the ekgMove sensor, please note the following:

- Disconnect the sensor from chest belt, electrode patch adapter or cradle
- Use a soft slightly moistened cloth
- Take care that no humidity enters the sensor housing

8.3 Cleaning the chest belt

If you want to clean the chest belt, please consider the following:

- Wash the chest belt by hand and not in the washing machine
- Use a liquid mild detergent
- Directly after washing, dry the chest belt at the air before storing or using it for new measurements.

8.4 Proper disposal

The Move II is subject to the EU directive WEEE (Waste Electrical and Electronic Equipment). Please consider your local regulations for waste disposal.

9 Technical Data

Power supply	Lithium-Ion battery
Supply voltage	3 V
Battery voltage	2,7 - 4,2 V
Number of charging cycles	300 with 1C/1C > 80%
Maximum recording capacity	At least 2 weeks, depending on firmware configuration
Battery run time (recording, Bluetooth off)	~ 2 days
Size of sensor (W x H x D)	62,3mm x 38,6mm x 10,5mm
Internal sensors	ECG-Amplifier: Resolution: 12bit, Input range CM=560mV, DM=+/-5mV, Gain 227, 3db bandwidth 1,6 to 33Hz Output rate: 256Hz to 1024Hz 3D acceleration sensor: Measurement range: +/- 8 g Noise: 4 mg Output rate: 64 Hz Pressure sensor: Measurement range: 300 - 1100 hPa Noise: 0,03 hPa Output rate: 1 Hz
Indicators	LED, 3-color (operation and charging status) Vibrating alert (start and end of measurement)
Interfaces	Micro-USB, Bluetooth

Environmental conditions	Temperature: -20 °C to 60 °C 0 °C to 45 °C during charging Humidity: 0 to 75% RH relative humidity Atmospheric pressure: 300 to 1100 hPa absolute

10 Legal Notes

10.1 Copyright

The software that comes with the Move 3 sensor is protected by copyright. Renting, exchanging, broadcasting, duplication or copies are not permitted.

10.2 Disclaimer

The material in this manual is for informational purposes only. The products it describes are subject to change without prior notice. movisens makes no representations or warranties with respect to this manual or with respect to the products described herein.

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